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With the Compliments of

ALEXANDER AGASSIZ.

ANNUAL REPORT
OF
THE CURATOR
OF THE
MUSEUM OF COMPARATIVE ZOÖLOGY
AT HARVARD COLLEGE,
TO THE
PRESIDENT AND FELLOWS OF HARVARD COLLEGE,
FOR
1893-94.

CAMBRIDGE, U. S. A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.

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Re. Dec. 20/ 1894.

FACULTY OF THE MUSEUM.

Faculty.

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ALEXANDER AGASSIZ, *Curator.* GEORGE L. GOODALE.

JOSIAH D. WHITNEY, *Secretary.* HENRY P. WALCOTT.

Officers.

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JOSIAH D. WHITNEY *Sturgis-Hooper Professor of Geology.*
NATHANIEL S. SHALER *Professor of Geology.*
E. L. MARK *Hersey Professor of Anatomy.*
WILLIAM MORRIS DAVIS *Professor of Physical Geography.*
J. ELIOT WOLFF *Assistant Professor of Petrography.*

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WALTER FAXON *Assistant in Charge.*
D. D. SLADE *Assistant in Osteology.*
SAMUEL GARMAN *Assistant in Herpetology and Ichthyology.*
WILLIAM BREWSTER *Assistant in Ornithology and Mammalogy.*
ALPHEUS HYATT *Assistant in Palæontology.*
SAMUEL HENSHAW *Assistant in Entomology.*
MISS F. M. SLACK *Librarian.*
MAGNUS WESTERGREN *Artist.*

APPOINTED BY THE PRESIDENT AND FELLOWS.

ROBERT TRACY JACKSON *Instructor in Palæontology.*
J. B. WOODWORTH *Instructor in Geology.*
H. L. SMYTH *Instructor in Geological Surveying.*
G. H. PARKER *Instructor in Zoölogy.*
W. McM. WOODWORTH *Instructor in Microscopic Anatomy.*
C. B. DAVENPORT *Instructor in Zoölogy.*
H. S. JENNINGS *Assistant in the Zoölogical Laboratories.*
H. V. NEAL *Assistant in the Zoölogical Laboratories.*
ROBERT DECOURCEY WARD *Assistant in Meteorology.*
RICHARD ELWOOD DODGE *Instructor in Geology.*
LEON S. GRISWOLD *Instructor in Geology.*
R. A. DALY *Assistant in the Geological Laboratory.*
C. L. WHITTLE *Assistant in the Petrographical Laboratory.*
C. R. EASTMAN *Assistant in the Palæontological Laboratory.*

REPORT.

TO THE PRESIDENT AND FELLOWS OF HARVARD COLLEGE:—

DURING the past year the usual courses of instruction have been given at the Museum in the Natural History Laboratories. Those in Zoölogy were given by Professor Mark, Dr. Slade, Dr. Davenport, and Dr. Parker, assisted in the Laboratory work by Messrs. W. E. Castle, J. H. Gerould, H. V. Neal, and W. S. Nickerson. Dr. W. McM. Woodworth has, as in previous years, taken charge of the Laboratory work, and has given some lectures in the course on Microscopical Anatomy.

Professors Whitney, Shaler, Davis, and Wolff gave courses of instruction in Geology, Palæontology, Physical Geography, Meteorology, and Petrography. Messrs. Harris, Robert T. Jackson, J. B. Woodworth, R. E. Dodge, C. E. Ladd, T. A. Jaggar, L. S. Griswold, R. DeC. Ward, and H. L. Smyth were the Assistants in these Departments.

For the details of these courses of instruction, as well as of the summer courses in Geology, I would refer to the accompanying special reports of the Professors and Instructors.

Professor Davis spent the past summer in Europe, with the special object of studying certain rivers and valleys in England, France, and Würtemberg, and of attending the Sixth International Geological Congress in Zurich.

The Newport Marine Laboratory has, as usual, been open to advanced students in Zoölogy. Eight students spent a part of their time in the Laboratory collecting material for their special investigations, which they will continue at the Museum, and prepare for publication.

The Laboratory has been equipped with a microphotographic apparatus. Dr. W. McM. Woodworth, who spent considerable time

at Newport, made a large number of slides of interesting pelagic types. He assisted me materially in preparing the illustrations for an article on some variations of the genus *Eucope*, which we hope to publish jointly during the coming winter. From our short experience with photography at the sea-shore, it is evident that it is destined to become an important adjunct to every marine laboratory as a rapid method of sketching, not only pelagic types, but fresh preparations, whether microscopic or macroscopic.

We have to thank Colonel Marshall McDonald, United States Fish Commissioner, for the facilities granted to our students in connection with their work at the Fish Commission Station at Wood's Holl.

It is greatly to be desired that, in addition to any general laboratory for research which may in the future be established, the University should have its own marine laboratory, in charge of the same instructors in the different departments, who are now obliged to discontinue the supervision of their students during a great part of their advanced work.

The income of the Virginia Barret Gibbs Scholarship was divided, according to the terms of the gift, among some of the students who occupied their time in the study of marine zoölogy.

Colonel Marshall McDonald has returned to us in excellent condition the material sent by the Museum to the Fish Commission Building of the Columbian Exhibit. The photographs illustrating the characteristic exhibition rooms have also been returned.

On account of the greatly increased number of visitors at the Museum on Sundays, the city of Cambridge has detailed a special policeman for duty on that day.

The Museum has received an anonymous contribution, which was applied to the increase of Dr. Hagen's salary during a part of the past fiscal year.

We are indebted to Professor Hyatt for the care he has given to the Palæontological Collections in his charge, and to Mr. Brewster for his interest in supervising the care of the collection of Birds and Mammals.

Owing to the immense accumulations of collections in former years, it has often been impossible for the Assistants in charge to take proper care of the accessions, so that much material was often misplaced or improperly labelled. Our staff is so limited in numbers that it is most difficult for us to distribute their work

to the best advantage of the collections. This is specially true of the large alcoholic and dry collection of Marine Invertebrates. Fortunately, thanks to Professor Faxon's interest in the collections placed under his charge, this unsatisfactory state of things is fast approaching an end. Mr. Faxon has also been indefatigable in his care of the exhibition collections. They have been greatly improved in their appearance since he has taken general charge of the exhibition rooms.

Our magnificent collections of Fossil Vertebrates and Invertebrates remain without a special custodian. Under these conditions it is of course impossible for us to fill intelligently the existing wants, and keep the collections up with the demands of the day. Until the means are provided for two Assistants, one for Vertebrate and one for Invertebrate Palæontology, we cannot hope to make any progress towards the arrangement of the Palæontological Exhibition Rooms.

The unfortunate condition of things existing in the Palæontological Department is not wholly limited to those collections. It exists in nearly all the other departments, but to a less degree,—as in Conchology, in Entomology, in Marine Invertebrates, and in Birds and Mammals.

While it is not within the province of a University Museum to compete with national, state, or municipal establishments, either in this country or abroad, it should be possible for a University Museum to provide not only for the maintenance of collections necessary to promote original research among its Professors, but it should be also possible to make appropriations to obtain such additions to this material, either by purchase or by sending out collectors, as will keep the Professors and Assistants in touch with the progress of their departments.

In the Entomological Department I have to note the increased use of both the collections and library by entomologists and students.

Comparatively little progress has been made with the arrangement of the Geological and Geographical Exhibition Rooms, owing to the want of money for obtaining the necessary cases. With a very moderate expenditure a beginning might be made by using temporarily the cases from the Chicago Exposition given to the Geological Department by the Corporation, as a large number of specimens, both large and small, have been brought together, so

that an exhibit of sufficient interest to warrant opening the rooms could probably be arranged.

The equipment of the Lecture Room of the Geological Department has been greatly improved by the installation of an electric lantern, and the formation of an extensive collection of Photographs (the Gardner Collection), and the accumulation of a great number of lantern slides specially selected by the different instructors.

I must again call attention to the crowded condition of the Laboratories of the Zoölogical and Geological Departments, which causes great loss of time to both instructors and students. Some of the Assistants in those Departments are temporarily housed in the rooms devoted to special collections, and do not have the facilities for work to which they are entitled. No progress has been made towards the equipment of the needed Vivarium and Aquarium.

In view of the increased demands made upon the Museum by the growth of the Undergraduate Department, from which our income is in no way benefited, the Corporation has kindly voted an annual subsidy of fifteen hundred dollars to the Museum, as repayment for the expenditures made in the past by the Museum on behalf of the Undergraduate Department, this allowance to continue until the indebtedness of the Museum is extinguished.

Our exchanges of publications with scientific societies are on a satisfactory footing. The Library has received from that source the usual number of invoices. The number of volumes in the Library is now over twenty-four thousand.

A list of the publications of the instructors and officers of the Museum, other than those contained in our Memoirs and Bulletins, will be found accompanying the special reports.

For a complete List of the Publications of the Museum during the past year I would refer to Appendix A. The number of our publications has been much smaller than usual. We have only issued seven numbers of Vol. XXV. of the Bulletin,—less than one hundred pages. This is due in part to the number of unfinished Reports of the “Albatross” Expedition, now in press, and also to the inability of the Museum to provide for the printing of the usual number of contributions from the Natural History Laboratories.

Owing to the financial straits of the Museum, Dr. Mark has been

compelled to send the results of the work done in his department to various scientific societies for publication. He will thus be able to issue a few of the contributions from his Laboratory; but there are at least five numbers, which, with the accompanying plates, will nearly fill a volume of the Bulletin, for which no provision has been made. The Museum has no funds specially devoted to publications. We have been able so far to meet the wants of the Zoölogical Laboratory. But, owing to the large outlays incurred by the Museum for the benefit of the Undergraduate Department, we shall be able to publish only a part of the contributions to the Bulletin from the different Laboratories until the indebtedness of the Museum has been paid off. It is greatly to be hoped that this important function of the Museum will not be curtailed for any great length of time.

During the coming year the publications of the "Albatross" will more than supply this deficiency, as we may hope to issue the Monograph of Professor Ludwig on the Holothurians, and the Report of Dr. Bergh on the Opisthobranchs, of Dr. Ortmann on the Pelagic Schizopods, of Dr. Müller on the Ostracods, and of Dr. Giesbrecht on the Copepods, some of which are already in the hands of the binder, others in press, and others nearly completed. From the expedition of the "Wild Duck" to the Bahamas, a short paper by Mr. Dall on the Shells of the Bahamas, and one by Mr. A. G. Mayer on some Medusæ from the adjoining waters, have been sent to the printers. I have myself nearly revised the proofs of the Report on the Bahamas and the Coast of Cuba.

Mr. Garman has completed a Memoir on the Cyprinodonts of North America, mainly based upon material brought together by Professor Agassiz many years ago, and for which a number of plates had been prepared by Mr. Sonrel.

Professor Faxon's Report on the Crustacea of the "Albatross" is in the hands of the printer. It is accompanied by over sixty plates, which are nearly all printed.

I have also received from Professor Alphonse Milne-Edwards the manuscript for a fine Monograph on the Galatheidæ of the "Blake" written in conjunction with Mr. Bouvier. This memoir is accompanied by twelve plates, which are now in the hands of the lithographer.

In connection with the explorations of the "Wild Duck" along the coast of Cuba, there were many interesting points connected

with the history of the elevated coral reefs to which it was impossible for me to give the necessary attention. I therefore gladly availed myself of the proposition of Professor R. T. Hill of the United States Geological Survey to make an extended examination of parts of the coast of Cuba. The Director of the United States Geological Survey was kind enough to grant him leave of absence for three months. Professor Hill's expedition was most successful. I have received from him an interesting Report on the Geology of the Cuban Coast. This will be published in the Museum Bulletin as soon as the necessary illustrations can be prepared. An abstract of his observations has been published in the September number of the American Journal of Science.

I have myself prepared for the Bulletin a Report of my last winter's visit to the Bermudas. This will be published in the same volume with the Report on the Bahamas. These two papers are specially devoted to the geological history of the Bahamas and Bermudas, and to the study of their coral reefs in connection with those of Florida and the Caribbean Sea, as well as the living and elevated reefs of the Cuban Coast.

From Messrs. Charles Wachsmuth and Frank Springer we have received the manuscript and plates of their Memoir on the Crinoidea Camerata of North America. This will form one of the most important publications on the subject ever issued. The authors have devoted years to the preparation of this magnificent monograph. The beginning of the work dates back to the time when Mr. Wachsmuth was Assistant at the Museum, having come to Cambridge at Professor Agassiz's request to take charge of the collection of Crinoids, of which the material brought together by Mr. Wachsmuth constituted an important part. After leaving Cambridge, Mr. Wachsmuth settled in Burlington, in the midst of the richest field of Fossil Crinoids, and commenced a second collection. He then became associated with Mr. Springer, and the work interrupted more than twenty years ago was resumed, and has just been brought to a happy termination. To complement their own unrivalled private collection, the authors have been supplied with material from all private and public collections of the United States, and from many persons and public institutions abroad.

The Monograph is accompanied by 83 exquisite plates, drawn under the supervision of the authors in their Museum, by Messrs.

Westergren and Ridgway. The publication of so elaborate a Memoir will naturally require considerable time ; but we hope to issue it as fast as it is practicable to print the manuscript and prepare the plates for publication, it will occupy one volume of text and one of plates.

Mr. J. N. Rose, of the United States Department of Agriculture, has published a Report on the Plants collected at the Galapagos during the "Albatross" Expedition of 1891, in Vol. I. No. 5 of the Contributions from the United States National Herbarium.

Professor Verrill reports good progress with his Memoir on the Alcyonaria of the "Blake." About forty plates are now completed. Dr. Hartlaub is also well advanced with the Report on the "Albatross" Comatulæ. Mr. Hoyle has a number of plates in hand to illustrate his Report on the Cephalopods, and Professor Studer has the greater part of his Memoir on the Alcyonaria in hand. With the consent of Colonel Marshall McDonald, a set of deep-sea Crustacea from the "Albatross" was sent to Professor Chun, who will prepare a Report on the Eyes of Deep-Sea Crustacea in comparison with those of the surface and pelagic types.

Dr. A. Goës writes that he has completed his Report on the "Albatross" Foraminifera, and that the manuscript, with the accompanying plates, is on its way to the United States. The collections of the "Albatross," as well as those made by the "Wild Duck" at the Bahamas, and the large collection of bottoms from the Caribbean and the east coast of the United States, sent him for comparison by the United States Coast Survey, the Fish Commission, and the National Museum, are also packed and ready for shipment.

Mr. Westergren, having completed the plates for Mr. Faxon's Monograph on the Crustacea of the "Albatross" Expedition, has been occupied in drawing the illustrations for Mr. Garman's Monograph of the Fishes of the same Expedition. Over twenty plates have been finished.

I may mention, as among the more important invoices sent from the Museum, the collection of deep-sea Crustacea and Echinoderms forwarded to the Oxford Museum with the consent of the Fish Commissioner.

Material for study has been sent, among others, to Mr. True, to Dr. Plate, to Messrs. Wachsmuth and Springer, and to Professor

McMurrich. Mr. Kofoid, of Ann Arbor, will prepare a paper on the interesting group of Solenogasteridæ based upon material collected by the "Albatross" both in the Atlantic and in the Pacific. The Atlantic species have been intrusted to Mr. Kofoid by Professor Goode of the National Museum.

We have to thank Professor Mendenhall of the Coast Survey, and Commander Sigsbee of the Hydrographic Office, for charts, and for other assistance connected with my expeditions to the Bahamas and to the Bermudas. To Professor George Davidson we are indebted for a specimen of trachyte from Clipperton Island, and for a sketch of that atoll. To Captain Wharton of the British Hydrographic Office I am also indebted for information regarding some early charts of the Bahamas, and to Captain Barr, R. N., and to the Hon. A. Allison for assistance during my visit to the Bermudas.

Among our most important acquisitions I may mention a collection of birds from the "Albatross" Expedition of 1891, collected at the Galapagos, and determined by Mr. Robert Ridgway, and a general collection of shells, presented by the family of the late William M. Wheildon of Concord, Massachusetts.

From the United States Geological Survey, through the National Museum, we have received a fine slab of *Climactichnites Youngi*, and some interesting fossils have been purchased from Mr. Charles Sternberg. From the Royal Museum of Brussels we have received an admirable cast of an *Iguanodon*, which we propose to mount as the central piece of the Jurassic Exhibition Room. We are indebted to Professor Dupont for the great trouble he took in making the arrangements necessary to procure this cast.

Mr. C. B. Riker has sent us an important series of borings from an artesian well on Port Royal Spit, Jamaica, which passes through the coral reefs of the Point. It is interesting to note that a preliminary examination of the specimens indicates a very moderate thickness of reef rock resting upon the older limestones.

To Professor Verrill we are indebted for sending us a series of corals collected by Professor Gabb from the elevated reef of Santo Domingo, for comparison with the species collected at various points of the elevated reef of Cuba during the "Wild Duck" Expedition. None of the species examined appear to differ from the Cuban types, and they also appear to be identical with species now living in the West Indian seas. To Dr. Dall we are indebted

for an examination of the Tertiary Mollusks of the Cuban coast collected by the "Wild Duck."

Mr. Scott, I regret to state, has been unable to make any progress with his plans for the benefit of the Ornithological Department.

Among the collections sent us by the Fish Commission, which supplement the pelagic material collected by the "Albatross" in 1891 off Central America in the Pacific, is a small collection made by the "Albatross" with the Tanner tow-net on the line between San Francisco and the Sandwich Islands and in the Bering Sea. Captain Tanner reports that in the northern part of the Pacific the net was not used below two hundred and fifty fathoms from the surface, and when closed at that depth it usually contained very little. In the hauls made at three hundred fathoms from the surface, on the other line, the closed part of the Tanner net did not bring up anything.

The Faculty of the Museum nominated, as occupants of the Naples Table for parts of the year 1893-94, Mr. E. L. Rice, a graduate of Wesleyan College, Middletown, who was recommended by Professor Richard Hertwig of Munich, and Mr. C. M. Child, recommended by Professor Leuckart. During the coming year Professor W. E. Ritter of the University of California, and Professor Reighard of the University of Michigan, formerly students of Professor Mark, will occupy the Museum Table at Naples.

To Baron Osten-Sacken has been sent his entomological correspondence, deposited in the Museum Library many years ago, to assist him in working up many interesting points in the history of North American Diptera.

Miss Rathbun, of the National Museum, spent some time at the Museum examining the types of the "Blake" deep-sea Crustacea, and other collections of that group. Professor Nutting, of the State University of Iowa, brought his collection of Florida Hydroids to the Museum for comparison with the types collected by the "Blake," and described by Allman and others.

The Geological department, following the example of the Zoölogical Department, is paying considerable attention to the formation of collections intended as means of instruction by the Professors, and also to the collection of other material to be known as students' collections, which are to be placed in the hands of the students and to be replaced as fast as may prove neces-

sary. In a University Museum like ours, which displays only a small part of its resources to the public, and where the great bulk of the collection is stored in smaller rooms to be available for research, such a course as that pursued by the Geological Department is essential. There is a natural temptation for the Instructors to make the freest possible use in their class-room of the specimens originally placed on exhibition only for the benefit of the public, and of the students as part of that public. It needs but little experience to show that the use of the collections intended either for exhibition or for research for purposes of instruction is ruinous. No specimen can be moved from its case without detriment, and it seldom goes back to its place in as good a condition as it left it.

The Director of a Museum must decide how far it is for the benefit of science to allow specimens once placed on exhibition or intended for research to leave their shelves. My own experience teaches that, when a collection is once placed on exhibition, no one should be allowed to have access to the cases or to the special collections to remove the specimens, and nothing should sanction their use for purposes of instruction or of scientific examination except in the clearest case of a positive gain for science by such a course. The Director of a Museum intended to meet the demands of the public, of the investigator, of the teacher, and of the student must provide each with the suitable material, and all attempts to perform these various functions with one collection will necessarily fail. This principle means of course a large amount of duplication, but this is essential for the safekeeping of valuable collections, which are too often sacrificed for comparatively unimportant scientific indulgences.

ALEXANDER AGASSIZ.

CAMBRIDGE, October 1, 1894.

REPORT ON THE COURSES OF INSTRUCTION IN GEOLOGY.

DURING the Academic year 1893-94, the following named courses of instruction were given in the laboratories and in the field by the instructors of the Department of Geology.

Instruction in General Geology.

1. (Geol. 4.) A whole course in Elementary Geology ; two lectures a week by N. S. Shaler, with a third lecture and an hour for special exercises by R. E. Dodge, and with required reading and field work. Attended by two hundred and thirty-eight students.

2. (Geol. 5.) A half-course in Practical Geological Exercises in the laboratory and in the field, requiring three two-hour exercises a week, with occasional lectures during the second half-year : by T. W. Harris, assisted by G. E. Ladd ; designed especially for those who intend in subsequent years to continue the study of Geology and Palæontology. Attended by forty-three students.

3. (Geol. 8.) A course in General Critical Geology ; two lectures a week, by J. B. Woodworth, with an additional hour for review. During the autumn and spring ten half-day excursions were made in the field to points in the vicinity of the University. Each student prepared a thesis during the winter months and a map and report upon some locality in the neighborhood. Seventeen students took this course.

4. (Geol. 9.) A course in the Structural and Dynamical Geology of the Stratified Rocks, by T. W. Harris. Two conferences a week, with required reading and theses. This course was attended by one student.

5. (Geol. 22.) A course in Field-work and Geological Surveying, designed to afford special training in original investigation, with work in the library and in the preparation of geological reports, conducted by Mr. Griswold, under the direction of N. S. Shaler, W. M. Davis, and J. E. Wolff. Conferences were held once a week during the year. It was attended by fourteen students.

Instruction in Petrography.

6. (Geol. 12.) A course in Petrography, by J. E. Wolff, assisted by T. A. Jaggar, Jr. Two lectures a week, with laboratory work, theses, and field-work. Attended by eight students.

7. (Geol. 23.) A course in Petrographic Research, by J. E. Wolff. Field and laboratory work. Attended by eight students.

Instruction in Economic Geology.

8. (Geol. 18.) A course on the Economic Geology of the non-metalliferous minerals, by J. D. Whitney. Lectures twice a week, with required readings and theses. Attended by nineteen students.

Instruction in Mining Geology.

9. (Geol. 10.) A course in Mining Geology, by H. L. Smyth. Lectures, laboratory and field work; half-course, three times a week, beginning the first Monday in December and closing the last Friday in April.

10. (Geol. 11.) A course in Geological Surveying, by H. L. Smyth. Lectures, laboratory and field work, three times a week, beginning the first Monday in December and closing the last Friday in April.

Courses 10 and 11 are specially intended for students in the Lawrence Scientific School, and cannot be counted for the degree of A. B. except by special vote on petition.

Instruction in Palæontology.

11. (Geol. 14.) A course in Palæontology, by N. S. Shaler, assisted in the laboratory by R. T. Jackson. Two lectures and four hours of laboratory a week, with theses. This course was attended by twelve students.

12. (Geol. 15.) A course in Historical Geology, designed to train advanced students in the use of fossils in determining geological horizons, by N. S. Shaler, assisted by R. T. Jackson. This course was taken by nine students.

13. (Geol. 24.) A course in Palæontological Research, under the direction of N. S. Shaler, assisted by R. T. Jackson. Attended by two students.

Instruction in Meteorology and Physical Geography.

14. (Geol. 1.) A half-course in Elementary Meteorology, by W. M. Davis, assisted by R. DeC. Ward. Two or three lectures a week, with laboratory work and recitations, second half-year. Attended by fifty-nine students.

15. (Geol. 2.) A half-course in Physical Geography, by W. M. Davis, assisted by L. S. Griswold. Two or three lectures a week, with laboratory work and recitations, first half-year. Attended by fifty-five students.

16. (Geol. 20.) A course in Advanced Meteorology and Physical Geography, by W. M. Davis. Conferences held once a week. Attended by nine students.

REPORT OF THE STURGIS-HOOPER PROFESSOR OF GEOLOGY.

BY PROFESSOR J. D. WHITNEY.

DURING the past year (1893-94), in accordance with the plan proposed in his last Report, the Sturgis-Hooper Professor delivered a course of lectures on Economical Geology, extending through the whole year, and devoted exclusively to the non-metalliferous minerals, water, salt, and saline substances in general, coal and petroleum being the substances treated with the largest amount of detail. In the next year the metals and their ores will be taken up, and the lectures and instruction given will be entirely confined to this subject. With this arrangement much more time will be given to the metals than has before been possible, since the whole subject of Economical Geology will occupy fully a hundred and ten lectures. This development of the instruction in this branch of the science will be useful to students of general geology, and more especially to those who intend to become teachers, or to engage in practical geological work. For those who may wish to go still farther in this direction, and make a specialty of mining engineering, the information acquired during this course will be found useful, as enabling them to plan their future studies, and to select a place where these can be pursued with those special advantages which are offered by the great mining schools at home or abroad.

The Library collected by the Sturgis-Hooper Professor is already fairly complete in the departments of Mining and Metallurgy, there being but few important works in those branches which are not found in it, while additions are being constantly made. The same is the case also with regard to that department of Economical Geology which relates to the non-metalliferous minerals, both from the scientific and economical point of view. Some progress has been made in cataloguing and arranging this library, and new

shelving has been added, and these facilities have led to a more extended use of the books in this department than has before been possible. This library is already so extensive, and is increasing so rapidly, that a large amount of time is required for the reception, binding, and arrangement of the new works which are added to it. Here, as in other departments of the Museum, the needs are beginning to exceed the means. The rapidity of the increase during the past few years in the number and bulk of geological and mining books issued from the press is indeed most remarkable.

During the past year, in accordance with the suggestion made in the Sturgis-Hooper Professor's last Report, a Supplement to his work on the United States has been prepared and issued. This work embraces, in about 350 pages, similar in form and style to the original volume, the subjects of population, immigration, and irrigation, much the larger part of the work being devoted to the last-named topic. In this volume the statistics of population are brought down to the latest possible date, including the results of the Census of 1890, the original work having been published just before that was taken. The statistics of immigration include the essential facts down to as late as the end of the first half of the year 1894.

In the original work to which the present volume forms a supplement, the subject of irrigation was not touched upon at all, and chiefly because detailed information regarding it was, so far as the United States are concerned, almost entirely wanting, much the larger portion of the already somewhat voluminous literature relating to this subject bearing dates more recent than 1890. Investigation of the material published by our government, in the reports of the various irrigational and geological surveys, showed that very interesting scientific and economical problems were involved in the irrigation question, and it seemed decidedly worth while that there should be made of it an analytic and critical review from an entirely disinterested standpoint. This, it is believed, has been done, and it is hoped that the volume thus prepared will be found useful to teachers and others interested in the physical geography of the country and the development of its resources. As an Appendix to this volume, there has been added a brief discussion of the question whether changes of climate can be brought about by the agency of man, and on secular

changes of climate in general, with special reference to the arid region of the United States. This part of the work naturally connects itself with the previously published volume of the Sturgis-Hooper Professor, which appeared in the *Memoirs of the Museum* twelve years ago, and bears the title of "The Climatic Changes of Later Geological Times: a Discussion based on Observations made in the Cordilleras of North America."

REPORT ON COURSES IN GENERAL GEOLOGY AND PALÆONTOLOGY.

BY PROF. N. S. SHALER.

Courses.

THE course in Elementary Geology was conducted during the year with the aid of Mr. R. E. Dodge as Assistant. Systematic field-work was introduced in the fall and spring to take the place of excursions before required in Course 5, which was given in the last half of the year. Dr. T. W. Harris, who conducted the laboratory course (Geol. 5), severs his connection with the department at the end of the academic year, and has accepted the position of Superintendent of Schools at Keene, N. H.

Owing to the pressure of his duties as Dean of the Lawrence Scientific School, the Professor of Geology, at the beginning of the year, relinquished the instruction in Course 8, General Critical Geology, and Mr. J. B. Woodworth was appointed Instructor for that course. In addition to giving the lectures, Mr. Woodworth has also conducted special exercises and all of the field excursions, in which Professors Davis and Wolff assisted in former years. During the April recess, a party of students from this course visited the well known section at Gay Head, on the island of Martha's Vineyard, under the guidance of Mr. Woodworth and Dr. Jackson. Four days were spent in continuous field-work upon the cliffs and neighboring parts of the island.

The instruction in Palæontology has been kept up, as in the previous year, with the aid of Dr. Jackson, who continued the effort to increase and improve the condition of the teaching collections in which considerable advance has been made. During the year, Mr. T. Wayland Vaughan, a Graduate student in Geology, was given some employment in determining and labelling Tertiary fossils, which group is his line of specialty. Most satisfactory

assistance was received from Mr. H. W. Dutch, a member of the Sophomore Class, who, as the recipient of a Price-Greenleaf Scholarship, spent four hours a week in doing clerical work.

Courses 10 and 11, the former relating to Mining Geology and the latter to Geological Surveying as carried on in mining work, were given during the year by Mr. H. L. Smyth. For lack of room elsewhere, the lectures in these courses were given in the Petrographical Lecture Room. Field-work was prosecuted in the vicinity of the University.

The course in Research (Geol. 22) was directly supervised by Mr. Griswold, who spent much of his time in the fall and spring in the field with students. The attention of the students was mainly directed to the structure of the rocks in the Boston basin and the contiguous areas of Carboniferous rocks in the Narragansett Basin. The valuable results obtained will be embodied in future publication. Shore phenomena in Eastern Massachusetts and metalliferous deposits in Essex and Berkshire Counties were also investigated. In the spring an excursion was made to Katahdin Iron Works, Maine. One student conducted a series of experiments with wave and current marks with a view to publishing the results. Mr. T. Wayland Vaughan, graduate student, carried on during the year an investigation of the Eocene fauna of Louisiana, and prepared a report for publication. At the beginning of the present government year, he was appointed assistant palæontologist of the United States Geological Survey and was assigned to duty in the southwestern States. Mr. Alfred Brooks, graduate student in geology, was also appointed assistant geologist in the same organization and proceeded in mid-summer to the southern Appalachians. Mr. F. P. Gulliver accompanied Mr. Gilbert of the Survey in an expedition to Colorado, and Mr. F. C. Schrader, another graduate student, was employed as a temporary assistant of the Survey in southern New England. Mr. Merrill, graduate student of year before last, has presented for publication in the Bulletin of the Museum of Comparative Zoölogy a paper on flint sponge spicules from the cretaceous of Texas.

Additional Courses.

For many years a considerable share of the time in Courses 4 and 8 has been given to the subject of glacial geology, and with a

view to bringing this matter into better form to meet the demands for instruction on this subject, a new course has been provided for during the coming year, to be given by Mr. Woodworth. Mr. Smyth has arranged to give in the coming year an additional course on the Pre-Cambrian Geology of North America, and advanced students in Geology who wish to carry on original researches will be enrolled in the following year in Course 22b.

The Geological Conference.

During the year, the Tuesday evening meetings of the advanced students in the department have been maintained. The papers read at these meetings have been announced each week in the College Calendar.

It should be mentioned in this connection that the Geological Society of America met in the Geological Lecture Room for one day in December last, thus affording our students an opportunity of attending a session of this organization.

Scientific Work.

The Professor of Geology has continued his services as a Commissioner in the State Board of Highways, and also as a Geologist of the United States Geological Survey. During the year, he prepared a Report on the Geology of Highways for publication by the Survey, and supervised the work of several assistants.

Mr. J. B. Woodworth has also been employed in his spare time and during vacations as Assistant Geologist of the U. S. Geological Survey, mainly in the preparation of maps of the Pleistocene Geology of the New England States. The following named map-sheets have been surveyed and prepared for the engraver, with an accompanying report: in Massachusetts, Boston, Nantucket, Muskeget, Martha's Vineyard, Gay Head (in part); in Rhode Island, Providence, Burrillville, Narragansett Bay, Newport, Sakonnet, Block Island; in Connecticut, New Haven and Meriden.

Mr. R. E. Dodge has also been employed during vacations heretofore in work of this nature. During the field season just closed, he was employed as volunteer assistant of Dr. Hayes in Tennessee.

Dr. Geo. E. Ladd, who assisted Dr. T. W. Harris in Course 5, performed during the year a series of tests upon clays, the results

of which were embodied in his thesis for the philosophical doctorate. He conducted the elementary course in geology in the summer schools, and at their close went to Munich, Germany, to continue his studies. Dr. Ladd and Mr. Jagger also attended the International Congress of Geologists held at Zurich. Mr. Griswold attended the International Congress of Geologists at Zurich the past summer, and with members of the Congress made excursions through the Juras and Alps for the purpose of studying physiographic and dynamic phenomena.

A list of the publications of the members of the department is appended to the Reports.

Equipment.

Since the introduction of the stereopticon in the Geological Lecture Room two years ago, the curtains for darkening the room have been raised and lowered by hand, much to the inconvenience of the lecturer and the students. During the summer of 1894, Dr. Wolff and Mr. Woodworth installed a half horse-power motor and windlass, by means of which the curtains on both sides of the room can be pulled down simultaneously to any desired place and released at will.

Another 2,500 candle-power arc lamp has also been imported from Germany for use in the Petrographical Lecture Room, the one heretofore employed being reserved for the Geological Lecture Room.

Illustrative Materials for Teaching.

With the use of the stereopticon, the method of illustrating lectures before large classes has been greatly changed. Not only does the practice permit of the freer and better exhibition of photographs reproduced in lantern slides, but by photographing standard published sections, and reproducing them in the stereopticon, considerable advantage both in the amount and fidelity of drawings is gained. Following this plan, lantern slides have been prepared for use in Courses 4 and 8, exhibiting the principal types of mountain structure, faults, folds, etc., in their actual occurrence. To a limited extent the same method has been pursued in the elementary class in the illustration of the characteristic fossils of the principal geological epochs.

It is proposed to publish for the use of colleges and schools at

the earliest convenient date a list of the views which experience in the lecture room has shown to be serviceable in our system of instruction. The plan provides for the sale of the photographs and lantern slides by some reputable dealer, so that the time of the officers of the department will not be taken up by the business and correspondence which may grow out of the undertaking.

The Gardner Collection of Photographs.

The selection and purchase of these views has been during the year in the hands of a Department committee consisting of Professor Davis and Messrs. Dodge and Woodworth. A number of views mostly of European localities were added during the year. There is now a total of over 2,100 photographs, most of which are mounted on cardboard, labelled, and entered in a card catalogue, and ready for service. At present the collection is stored in trays in the Geological Lecture Room.

Geological Exhibition Room.

When the World's Fair Exposition closed, the Corporation kindly turned over to this department a number of wall and table cases which were used at Chicago for the display of the University Exhibit. These, to the number of twenty-four, have been placed in the Geological Exhibition Room on the third floor of the Museum, but owing to a lack of means for repairing the cases the Department has been unable to arrange its collections in them and open the room to the public. It will cost about \$300 to put the room in order.

Gifts and Purchases of Specimens.

A few specimens of rocks and fossils have been donated to the Department for use in its teaching collection during the year. Two segments of a basaltic prism from the Giant's Causeway were given by Prof. J. P. Cooke. A collection of rocks and clays were obtained by the members of an expedition to Gay Head, Mass., illustrating the stratigraphy of that section, and a few specimens needed for illustrating Glacial Geology and for classroom demonstration were gathered by Messrs. Woodworth and

Dodge from the immediate vicinity of the University. The following is a more complete list.

Object.	Remarks.	Donor.
Potsdam Sandstone.	From bored well on shore of Keeweenaw Bay.	Mr. John T. McClintock.
Norite.	Hand specimen from hanging wall of Gold Bronze Mine, Vanderbilt, Cal.	Mr. W. H. Thomas, Salt Lake City, Utah.
Æolian Pebbles.	From near Colorado River.	Mr. G. K. Gilbert, Washington, D. C.
Cross-Bedding.	From sandstone parting in Roxbury Conglomerate, Dorchester, Mass.	Mr. W. W. Dodge, Cambridge, Mass.

A collection from the Triassic of Connecticut was purchased of Mr. S. Ward Loper. This collection embraces fishes, plants, and certain geological features of the formation, as rain-drop impressions, ripple marks, etc. A box of Eocene fossiliferous sand from Claiborne, Alabama, was received from Professor P. H. Mell. This material was sorted and determined by Mr. Vaughan. The richness of the sand is attested by the fact that a half-bushel of it yielded one hundred and sixty species, mostly Mollusca. Representative Tertiary and some Cretaceous material from the Atlantic coast was received from Professor Wm. B. Clark of Johns Hopkins. As in previous years, thanks are due to Professor C. E. Beecher of Yale for material received from him. Cretaceous and Tertiary material from the West, and Carboniferous from Joggins, Nova Scotia, was purchased of Mr. George B. Frazar.

Especial mention should be made of the gift of two geological maps to the Department by the French Geological Survey. One of these is the large "Carte Géologique du Plateau Central," by MM. Delafond, Fontannes, Fouqué, De Launay, Le Verrier, Lory, Michel-Lévy, and Termier; the other map is the "Carte Géologique de la France" (à l'échelle du millionème).

REPORT ON THE PETROGRAPHICAL LABORATORY.

BY ASSISTANT PROFESSOR J. E. WOLFF.

THE course in Elementary Petrography was attended by eight students, and the advanced course by an equal number.

In connection with the latter course, field and laboratory investigation was carried on by students in the following areas : —

Ascutney Mountain, Vermont (Monograph in preparation).

Ayers Mountain, Connecticut.

Blue Hills, Massachusetts.

The Felsites and Associated Rocks in Saugus, Massachusetts.

In the summer of 1894 a six weeks' course in General Petrography was conducted at the Museum, and attended by four students, either teachers or members of geological surveys.

The Instructor has continued his field and laboratory work on the Archæan Highlands of New Jersey and elsewhere.

A considerable amount of petrographical material for exhibition purposes has accumulated by gift and otherwise, and awaits the opening of the Geological Exhibition Room.

REPORT ON THE LABORATORY OF PHYSICAL GEOGRAPHY.

BY PROFESSOR W. M. DAVIS.

DURING the Academic year 1893-94, the courses in Physical Geography and Meteorology have been conducted on the same plan as in previous years. Mr. Ward has continued to act as Assistant in the course in Meteorology, but has withdrawn from the course in Physical Geography, in order to give more of his time to editing the American Meteorological Journal, which has now been in his charge over two years. Mr. Griswold has acted as Assistant in Physical Geography, in addition to his duties in connection with the course in Field Geology.

The more advanced courses have been attended by six students, of whom four were college graduates. The special subjects studied were as follows: Mr. Abbe, the topographical development of shore lines, with special reference to the features of our Atlantic coast; Mr. Daly, the development of escarpments; Mr. Gulliver, the topographical criteria of the elevation or depression of the land; Mr. Marbut, the flood-plain of the Mississippi; Mr. Schraeder, the Great Plains of the West; Mr. White, the effect of local topography on the general winds, and the features of Arctic climate.

A gift of great value has been received from the Geographical Service of the French Army. The large series of geodetic and topographic maps of France and Algeria and the exquisite model of the valley of the upper Moselle, exhibited at the World's Fair at Chicago, were by direction of the Chief of the Service presented to the United States Coast and Geodetic Survey and the Harvard Laboratory of Physical Geography. The collection was divided by conference with the Superintendent of the Coast and Geodetic Survey, and a number of valuable maps, as well as the model, remain to enrich our collections.

Recognizing the disconnection of the elementary and the advanced courses, it is now proposed to introduce two intermediate half-courses on the Physical Geography of the United States, and of Europe, to be given in alternate years, beginning in February next.

Certain new material for the elementary courses may be briefly mentioned. First, a model, consisting of three elliptical rings at right angles to one another, around a black globe, has been constructed to illustrate the problem of the tides. In connection with the tracings of a selected series of tidal curves obtained from the United States Coast and Geodetic Surveys, this model serves to make the matter of the diurnal inequality, and its variation during a lunation, relatively simple. Second, a number of grouped sheets of foreign topographical surveys, selected according to the plan explained in previous Reports; the new members of this collection being chiefly from the German maps on a scale of 1:100,000. An account of the method pursued in the elementary course on Physical Geography, with special reference to its disciplinary value, was published in the [Chicago] Journal of Geology, for January, 1894.

Apart from the regular work of teaching, and from administrative duties connected with the Committee on Special Students, the work of the Professor of Physical Geography has been chiefly as follows. During the winter, four lectures were given to an audience of over a hundred teachers in Providence and its vicinity, by invitation from the Superintendent of Public Instruction in Rhode Island, on the physical features of that State, and especially on the illustration of these features given in the topographical map of Rhode Island, which had been previously distributed to all its schools. In the spring a list of 126 lantern slides, illustrating a number of typical examples of geographic features, such as plains, plateaus, mountains, volcanoes, rivers, glaciers, lakes, coasts, was made by selection from our laboratory collection, — a part of the Gardner Photographic Collection. The list was published, with explanatory notes, as an appendix to the Annual Report of the Superintendent of Schools of Cambridge for 1893. Arrangements have been made with Mr. E. E. Howell, 612 Seventeenth Street N. W., Washington, D. C., to supply both the lists and the slides at moderate price to teachers who desire them. In order to bring these slides to the notice of the teachers in the Cambridge schools,

a number of them were shown in two lectures to an audience of teachers and children from our Grammar Schools. A list of twenty-eight cloud views has been prepared by Mr. Ward, and published in the *American Meteorological Journal*; the prints and slides of these views can also be obtained from Mr. Howell.

The list of Governmental Maps for Use in Schools, referred to in last year's Report as in preparation by Messrs. Davis, King, and Collie, was completed during the winter, and published by Messrs. Henry Holt & Co. of New York. The use of a number of the maps here referred to was explained and illustrated in a special lecture to some thirty of the teachers of Cambridge in the spring.

The past summer has been spent in Europe, with the special object of studying the arrangement of certain rivers and valleys in Eastern England, Northeastern France, and Würtemberg, and of attending the Sixth International Geological Congress in Zurich. Besides the general accounts of this excursion, already published in "*The Nation*," as stated below, a special article on certain rivers in England has been prepared for the *Journal of the Royal Geographical Society of London*.

PUBLICATIONS BY MEMBERS OF THE GEOLOGICAL
DEPARTMENT SINCE THE LAST REPORT.

By N. S. Shaler : —

1. Pleistocene Distortions of the Atlantic Seacoast. Bull. Geol. Soc. Am., 1894, Vol. V. pp. 199–202.
2. Relation of Mountain Growth to Formation of Continents. Ibid. pp. 203–206.
3. Phenomena of Beach and Dune Sands. Ibid., pp. 207–212.
4. The Geological History of Harbors. Thirteenth Annual Report of the Director of the U. S. Geological Survey for 1891–92. Washington, 1894, pp. 93–209. Plates XXII.–XLV., Figs. 7–15.
5. The United States of America, 2 vols., pp. 670, 641 (Illustrated). D. Appleton & Co., New York, 1894.
6. The Origin and Nature of Soils. Twelfth Annual Report of the Director of the U. S. Geological Survey, for 1890–91, pp. 213–345. Washington, D. C., 1891. (Illustrated).
7. Report on the Work done in the Atlantic Coast Division of the U. S. Geological Survey, for the Year ending June 30, 1891. Twelfth Annual Report of the Director of the U. S. Geological Survey, Part I. pp. 66–67, Washington, D. C., 1891.
8. Edited Geological Terms in Standard Dictionary of the English Language (with Prof. W. B. Dwight), Vol. I. Funk and Wagnalls Co., New York, 1894.
9. Report on the work done in the Atlantic Coast Division of the U. S. Geological Survey for the year ending June 30, 1892. Thirteenth Annual Report of the Director of the U. S. Geological Survey, Part i. pp. 99–100, Washington, D. C. 1893 (title-page dated 1892).
10. Discussion on Facetted Pebbles, Bull. Geol. Soc. Am. 1894, Vol. V. p. 608.
11. Report of the commissioners of the Topographical Survey of the Commonwealth of Massachusetts for the year 1893 to His Excellency, Frederic T. Greenhalge. House. No. 74, pp. 3–30. (With Henry L. Whiting and Desmond Fitzgerald.)

By H. L. Smyth : —

Relations of the Lower Menominee and Lower Marquette Series in Michigan (preliminary). Am. Jour. Sci., 1894, (3rd. Ser.) Vol. XLVIII. pp. 216–223. Illustrated.

By W. M. Davis:—

1. *Elementary Meteorology*. Boston, Ginn & Co., 1894. 8vo, pp. xii. 355. Illustrated.
2. *The Winds of the Indian Ocean*. *Amer. Met. Jour.*, December, 1893, Vol. X. pp. 333–343. 2 plates. Also reprinted, and in German version, in *Annalen der Hydrographie*, Berlin, February, 1894.
3. *Winds of Atlantic Ocean*. German translation. *Annalen der Hydrographie*, Berlin, January, 1894.
4. *Biographical Notice of William Ferrel*. *Proc. Amer. Acad.*, Vol. XXVIII. pp. 388–393.
5. *The Redfield-Espy period*. *Rep. Chicago Meteorol. Congress*, pt. 2, pp. 305–316.
6. *Brief Meteorological Notes. The Theory of Cyclones*. *Am. Met. Jour.*, November, 1893, X. pp. 319–320. *Festooned, Mammi-form, and Pocky Clouds*. *Am. Met. Jour.*, August, 1894, Vol. XI. pp. 151–153. *Note on Diffusion of Water Vapor, and on Atmospheric Absorption of Terrestrial Radiation*. *Am. Met. Jour.*, August, 1894, Vol. XI. pp. 147–151.
7. Joint Author with others of *Report of Conference on Geography. In Report of Committee [of Ten] on Secondary Schools*. Washington, 1893, pp. 204–236.
8. *Governmental Maps in Schools* (with C. F. King and G. L. Collie) *Educational Rev.*, March, 1894, Vol. VII. pp. 232–239.
9. *Governmental Maps in Schools* (with C. F. King and G. L. Collie). New York, H. Holt & Co.
10. *Physical Geography in the University*. *Jour. of Geol.*, 1894, Vol. II. pp. 66–100.
11. *Instruction in Physical Geography*. *The Harvard Graduates' Magazine*, 1894, Vol. II. 509–515.
12. *The Osage River and the Ozark Uplift*. *Science*, November 17, 1893, Vol. XXII. pp. 276–279.
13. *Monadnock and Ben Nevis*. *The Nation*, August 9 and 16, 1894.
14. *The Seine, the Meuse, and the Moselle*. *The Nation*, September 6 and 13, 1894.
15. *Discussion on Railroad Location*. *Trans. Amer. Soc. C. E.*, 1894, Vol. XXXI. pp. 105–107.
16. *A Step towards Improvement in teaching Geography*. *Harvard Teachers' Association*. Leaflet No. 11, January, 1894.
17. *Geography in the Schools*. *Harper's Weekly*, April 7, 1894. pp. 322–323.
18. *Geographical Work for State Geological Surveys*. *Bull. Geol. Soc. Amer.*, 1894, Vol. V. 605–608.

19. List of Geographical Lantern Slides prepared for Use in the Cambridge Public Schools. Annual Report of School Committee, Cambridge, 1893, pp. 103-119. Also reprinted.

20. Syllabus of Four Lectures on Physical Geography, designed especially for Teachers in the Schools of Rhode Island. January 12, 19, February 9, 16, 1894. Providence, pp. 2.

21. Articles in Johnson's Cyclopedia (New Ed.) : Estuary, flood-plain, geyser, glacier, Glen Roy, gorge, Great Salt Lake, harbor, islands, Lake Lahontan, lakes, Luray Cavern. New York, June, 1893.

22. Facetted Pebbles on Cape Cod. Proc. Bost. Soc. Nat. Hist., 1894, Vol. XXVI. pp. 166-175. 2 photo-plates.

23. Eastern Boundary of the Connecticut Trias. (With L. S. Griswold.) Bull. Geol. Soc. Amer., 1894, Vol. V. 515-530.

24. An Outline of the Geology of Mount Desert : in the Flora of Mount Desert Island, by E. L. Rand and J. H. Redfield, Cambridge, 1894, pp. 43-71.

By J. E. Wolff : —

1. Notes on Apparatus for the Geological Laboratory. Am. Jour. Sci., May, 1894.

2. The Hibernia Fold, New Jersey. [Abstract.] Am. Geol. 1894, Vol. XIII. pp. 142-143.

In press : Monograph XXIII. U. S. Geological Survey, Part II., "Geology of Hoosac Mountain, Mass." Also : Geological Survey of New Jersey. Annual Report, 1894 : "The Geological Structure in the Vicinity of Hibernia, Morris Co., N. J., and its Relation to the Ore Deposits." With Map and four Plates.

By R. E. Dodge : —

1. Additional Species of Pleistocene Fossils from Winthrop, Mass. Am. Jour. Sci., 1894, Vol. XLVII. pp. 100-104.

2. Continental Phenomena illustrated by Ripple Marks. Science, 1894, Vol. XXIII. pp. 38-39.

3. The Geographical Development of Alluvial River Terraces. Proc. Boston Soc. Nat. Hist., 1893, Vol. XXVI. pp. 257-273.

By L. S. Griswold : —

1. Eastern Boundary of the Connecticut Trias. (With W. M. Davis.) Bull. Geol. Soc. Am., 1894, Vol. V. pp. 515-530.

2. The Harvard University Geographical Exhibit at the Columbian Exposition. Amer. Geol. April, 1894, pp. 279-283.

By T. W. Harris :—

The kames of the Oriskany Valley. *Am. Geol.* 1894, Vol. XIII. pp. 384-390.

By T. A. Jaggar, Jr. :—

Some Conditions of Ripple Mark. *Am. Geol.*, 1894, Vol. XIII. pp. 199-201.

By Geo. E. Ladd :—

A Sketch of the Literature of Clays. *The Brickbuilder*, Boston, Mass., 1894, Vol. III. pp. 75-78 ; 99-100.

By R. De.C. Ward :—

1. Recent Foreign Studies of Thunderstorms. *Am. Met. Jour.* 1893-94, Vol. X. pp. 411-420.

2. The Newspaper Weather Maps of the United States. *Am. Met. Jour.*, 1894-95, Vol. XI. pp. 96-107.

3. List of Cloud Photographs and Lantern Slides. *Am. Met. Jour.* 1894-95, Vol. XI. pp. 111-116.

4. Edited: *The American Meteorological Journal*. An Illustrated Monthly devoted to Scientific Meteorology and Allied Branches of Study. Boston, Ginn and Company, 1893-94, Vols. X., XI.

By J. B. Woodworth :—

1. On Traces of a Fauna in the Cambridge Slates. (Abstract.) *Proc. Bost. Soc. Nat. Hist.*, 1893, Vol. XXVI. pp. 125-126.

2. An Attempt to estimate the Thickness of the Ice-blocks which gave rise to Lakelets and Kettle-holes. *Am. Geol.*, 1893, Vol. XII. pp. 279-284.

3. Post-Glacial Eolian Action in Southern New England. *Am. Jour. Sci.* 1894, (3rd Ser.), Vol. XLVIII. pp. 63-71.

4. Some Typical Eskers of Southern New England. *Proc. Bost. Soc. Nat. Hist.*, 1894, Vol. XXVI. pp. 197-220.

5. Carboniferous Fossils in the Norfolk County Basin. *Am. Jour. Sci.* 1894, (3rd Ser.), Vol. XLVIII. pp. 145-148.

6. The Geology Excursion to Gay Head. *Harvard Graduates' Magazine*, 1893-94, Vol. II. pp. 536-538.

7. Werner's Real Contribution to Geology. *Science*, 1894, Vol. XXIII. pp. 19-20.

8. Text-book of Geology, by Sir Archibald Geikie. (Review of.) *Science*, 1893, Vol. XXII. pp. 235-237. Abstract reprinted in *Book Reviews*, 1893, Vol. I. pp. 184-185.

9. Economic Geology of the United States, by R. S. Tarr. (Review of.) *Science*, 1894, Vol. XXIII. p. 123.

10. Edited Geological Terms in Standard Dictionary of the English Language, Vol. I., 1894 (with Professors N. S. Shaler and W. B. Dwight).

11. The New Geological Map of Pennsylvania. Science, 1894, Vol. XXIII. pp. 143-144.

12. Abstracts of three Papers by Professor Shaler (Nos. 1, 2, 3 of this list). Am. Geol., 1894, Vol. XIII. pp. 143-145.

REPORT ON THE INSTRUCTION IN ZOÖLOGY.

BY E. L. MARK.

AT the beginning of the year 1893-94 the corps of instructors in the Zoölogical Department was increased. This has made it possible to offer to students additional courses, and to give more time to the supervision of those engaged in special researches.

The following table exhibits the courses and the number of students of the different classes attending each during the year.

Course.	Grad.	Sen.	Jun.	Soph.	Fr.	Spec.	Sci.	Div.	Total.
Zoöl. 1 . . .	4	7	18	20	25	7	42	1	124
" 2 . . .	4	7	7	8	0	0	26	0	52
" 3 . . .	5	3	3	1	0	0	8	0	20
" 4 . . .	4	1	1	0	0	0	3	0	9
" 5 . . .	3	1	1	0	0	0	1	0	6
" 6 . . .	3	1	0	0	0	0	1	0	5
" 7 . . .	6	2	0	0	0	0	4	0	12
" 20 ^a . . .	7	1	0	0	0	0	3	0	11
" 20 ^c . . .	2	0	0	0	0	0	0	0	2

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During the past year Dr. C. B. Davenport has had charge of Zoölogy 1 in addition to Zoölogy 2 and a new half-course, Zoölogy 6. The course in Zoölogy 2 will be given during the coming year by Dr. G. H. Parker, and the new course by Dr. Davenport in Experimental Morphology will then be a full course extending through the entire year.

The elementary course in Zoölogy (Zoöl. 1) was assumed for the first time by Dr. Davenport. The course, though pursuing in general the plan previously adopted, was slightly modified in its details. In the lectures more attention was given to Distribution and to General Physiology than formerly, and in the laboratory work less time was spent upon the tissues of higher animals and more upon such topics as these: Illustrations of the principles of classification; The

later stages of development and the metamorphoses of animals; Adaptation to environment. The chief Assistant in the laboratory work was Mr. W. E. Castle, and the sub-Assistants were Messrs. J. H. Gerould, H. V. Neal, and W. S. Nickerson.

As in 1892-93, Zoölogy 2 was carried on by Dr. Davenport, who had as Assistant in laboratory work Mr. W. S. Nickerson. The Department has been fortunate in having the services of Mr. Nickerson for a number of years in this course. He leaves this year to become Professor of Biology in the University of Colorado. It is scarcely to be expected that so faithful and efficient an Assistant can usually be retained in this position for so long a period. The lectures and the laboratory work have followed without material change the general plan long since adopted.

The new half-course by Dr. Davenport — Experimental Morphology — was conducted in the second half-year, a portion of the Aquarium Room in the basement having been fitted up to serve temporarily for this purpose. It was found that the room could not be adequately heated during very cold weather, but this will be remedied during the coming year. The course is intended for those who desire to pay particular attention to problems of growth and the development of organisms, with special reference to artificial modification and control. The introductory lectures were on methods of work in experimental morphology, the succeeding ones being devoted to variation in development as the result of crossing and of changes in external conditions.

The laboratory work of each student was distinct from that of the others. The following topics indicate the nature of some of the experiments: Individual adaptation of organisms to high temperatures; On the artificial modification of cleavage cavity and blastula; Influence of external conditions on the form of regenerated parts; The laws of individual and correlated variation.

Dr. G. H. Parker upon his return from Europe was reappointed Instructor in Zoölogy and has had charge of Zoölogy 3 and a new half-course, Zoölogy 7, occupying the first half-year.

In resuming charge of Zoölogy 3, Dr. Parker has continued the plan, inaugurated before he went abroad, of supplementing the lectures and regular class work in the dissection of Vertebrates by the assignment to each student of some topic in the Comparative Anatomy of the group. This plan has been found to succeed well, giving a desirable stimulus to individual work as distinct from

class work. The laboratory Assistant in the course was Mr. J. L. Frazeur.

The new course by Dr. Parker — Zoölogy 7, The Nervous System and its Terminal Organs — is intended to meet the needs of advanced zoölogical and prospective medical students, as well as those in other departments who desire to keep up with modern methods in the study of the nervous organization of animals and the important results to which they have led. The topics discussed in this course are, as announced in the annual Circular of the Department: —

- (1) Methods of investigating the nervous system.
- (2) General structure and functions of the nervous system. The neuron and its significance.
- (3) Terminal organs of afferent nerves. Types of sense organs and the origin of the afferent impulse.
- (4) Central organs. The transmission and translation of impulses.
- (5) Terminal organs of efferent nerves: muscles, electric organs, luminous organs, glands, etc.

The course has been successful, and may ultimately be expanded from a half to a full course.

The courses in Microscopical Anatomy (Zoöl. 4) and Embryology of Vertebrates (Zoöl. 5) were conducted in the same manner as during the previous year. Dr. W. McM. Woodworth had charge of the laboratory work and gave some of the lectures in Zoölogy 4.

The work of those engaged in research has been satisfactory, and the number of papers for publication exceeds that of any previous year.

The course in Comparative Osteology (Zoöl. 20*c*) by Dr. Slade was given as usual.

At the last Commencement the degree of Ph. D. was conferred on two students in Zoölogy, that of Sc. D. on one, and that of A. M. on four. Of those receiving the higher degrees two have positions in other colleges, one as Professor, the other as Instructor, and the third as a Parker Fellow from Harvard University is continuing in Europe his studies in Zoölogy.

The meetings of the Zoölogical Club have been well attended, and have afforded the usual opportunity for the discussion of current zoölogical topics and for reports on the progress of work in the research laboratories.

Since my last report the following Contributions from the Zoölogical Laboratory, Nos. XXXVIII.—XLI. have been published : —

XXXVIII. A Method of Orienting Small Objects for the Microtome. By W. McM. Woodworth. Bull. Mus. Comp. Zoöl., Vol. XXV. No. 3, pp. 45–47, December, 1893. Reprinted in The American Monthly Microscopical Journal, Vol. XV. No. 5, pp. 129–132. May, 1894.

XXXIX. On Some Laws of Cleavage in Limax. A Preliminary Notice. By C. A. Kofoed. Proc. Amer. Acad., Vol. XXIX. pp. 180–203. 2 Pls. February 25, 1894.

XL. Studies in Morphogenesis. II. Regeneration in Obelia and its Bearing on Differentiation in the Germ-Plasma. By C. B. Davenport. Anatomischer Anzeiger, Bd. IX. No. 9, pp. 283–294. With 6 Figures. February 15, 1894.

Also, “Nachtrag zu dem Aufsätze, von C. B. Davenport (No. 9, p. 283).” Ibid., No. 12, pp. 391, 392, Fig. 5. April 14, 1894.

XLI. The Origin of the Endocardium in Bony Fishes. By A. T. Holbrook. Bull. Mus. Comp. Zoöl., Vol. XXV. No. 7, pp. 79–97. 5 pls. August, 1894.

Three numbers of the Contributions are now in the press, and will be issued soon, viz. : —

1. On the Cell Lineage of the Ascidian Egg. A Preliminary Notice. By W. E. Castle. 2 Pls.

2. On the Blastodermic Vesicle of *Sus scrofa domesticus*. By A. W. Weyse. 4 Pls.

3. On the Introitus Vaginæ of certain Muridæ. By G. S. Miller, Jr. 1 Pl.

There are five more numbers for the Contributions, aggregating some two hundred or three hundred pages and upward of twenty plates, for the publication of which arrangements have not yet been made.

Besides the Contributions, some other productions by members of the Department have been published, or are well under way.

Dr. W. McM. Woodworth has published in the Bull. Mus. Comp. Zoöl., Vol. XXIV. No. 4, a Report on the Turbellaria of the “Albatross” Expedition in charge of the Director of the Museum during 1891.

The English translation of the first part of Korschelt u. Heider’s “Entwicklungsgeschichte der wirbellosen Thiere,” with additions

by the authors and translators, has been completed by Drs. Mark and Woodworth, and is being printed by Swan Sonnenschein & Co. of London and Macmillan & Co. of New York.

Dr. Parker has completed a memoir on The Retina and Optic Ganglia in *Astacus*, which will be published in the *Mittheilungen a. d. Zoöl. Station zu Neapel*.

A paper by Dr. Davenport and W. E. Castle, on The Acclimatization of Organisms to high Temperatures, is nearly completed.

The funds hitherto employed in publishing the Contributions from the Zoölogical Laboratory are not now available for that purpose. The Department is therefore in need of immediate aid for this object, to avoid the necessity of sending the Contributions to foreign journals, or to those in America which are conducted in the interests of other Universities. Although we still need as much as ever aquaria and vivaria, this unexpected deprivation of the means of publication is of far greater importance. No more efficient aid could be rendered to the Department of Zoölogy at present than the establishment of a fund to provide for the publication of researches carried on in the Zoölogical Laboratories.

REPORT ON OSTEOLOGY.

BY DANIEL DENISON SLADE.

THE osteological collections remain as stated in the last Report. No material has been added, owing to the lack of funds which might be so usefully applied to the increase of the collection of disarticulated skeletons, still sadly deficient in several of the orders.

Specimens, as heretofore, have been received for identification. Among these were portions of a human skeleton lately exhumed in the vicinity of Chicopee, Massachusetts. Being determined as Aboriginal, and as they offered several unusual and interesting anatomical points, with the permission of the gentleman by whom they were forwarded, they were presented to the Peabody Museum, for the advancement of the Science of Ethnology.

The plan adopted during the preceding year, for conducting the course of Comparative Osteology as one of research, was pursued, but with only partial success, as shown by the paucity of students who applied. The increased number of elective studies, and the addition of two half-courses in Zoölogy, given by teachers admirably fitted for the work, undoubtedly contributed in great measure to this result.

A plan similar to that published in the curriculum for the ensuing year will be adopted, with the expectation that it will not exclude those who wish to acquire a general knowledge of the framework upon which the bodies of Vertebrate animals is constructed, and which is so essential to the student of Zoölogy. At the same time, it will prove whether there are those who wish to avail themselves of the highest usefulness of the Museum, in pursuing original investigation in this as well as in other Departments.

During the past year, two Graduates, and others connected with the usual courses of instruction at the Museum, have made use of the material for study.

“The Significance of the Jugal Arch,” a paper announced in the last Report as ready for publication in the Museum Bulletin, has been delayed for the preparation of suitable illustrations.

REPORT ON THE MAMMALS AND BIRDS.

BY WILLIAM BREWSTER.

The following Mammals have been added to the collection during the past year:—

An Aye-Aye (*Chiromys madagascarensis*), bought of Ward; a Cheetah (*Cynelurus jubata*), the gift of Mr. Hart, of New York; a remarkably fine Jaguar (*Felis onca*), obtained from Mr. J. T. Clark; a black (melanistic) Woodchuck (*Arctomys monax*) and a Red-backed Mouse (*Evotomys gapperi*) from North Adams, Mass., presented by Mr. Walter Faxon; and five unidentified Japanese Mammals,—two Monkeys, a Badger, a Wild Boar, and an Antelope,—furnished by Mr. Alan Oroston, of Yokohama. The Aye-Aye, Cheetah, and Woodchuck are mounted, and already on exhibition.

Of Birds the Museum has received by gift:—

From Mr. Matthew Luce, Jr., of Boston, thirty-one mounted specimens and two hundred and sixty-four skins; from Mr. Allan C. Brooks, of Mount Forest, Ontario, Canada, nineteen skins; from the United States National Museum, through Mr. Agassiz, eighteen skins of Galapagos birds collected during the visit of the United States Fish Commission steamer “Albatross” to the Galapagos Archipelago in 1893; from Mr. Walter Faxon, eight mounted New England birds (chiefly Warblers and Sparrows); a nest and egg of Swainson’s Thrush (*Turdus swainsonii*), from Cape Breton, and a nest of the Orchard Oriole (*Icterus spurius*), taken at Arlington, Mass.; from Mr. John G. Hall, of Boston, a skin of the Wandering Albatross (*Diomedea exulans*); and from Mr. T. A. Hillery, of the Museum, an alcoholic specimen of the Brazilian Canary (*Sycalis*).

Mr. Luce’s gift deserves something more than a bare acknowledgment, for his collection contains a number of exceptionally fine

skins of some of the more brilliant of the Birds of Paradise, Old World Parrots, and Fruit Pigeons. Several of these are new to the Museum, and all are of considerable value. Most of the specimens, however, are North American, and very many of them were taken by Mr. Luce himself in the immediate neighborhood of Boston.

Mr. Faxon's birds are peculiarly acceptable, from the fact that they were collected with especial reference to filling gaps in the Greene-Smith Collection.

Of the Galapagos skins thirteen have been mounted for the Pacific Room, where they are now on exhibition in one of the cases devoted to "Island Faunæ."

Mr. Agassiz has purchased for the Museum seventy-two skins of Japanese birds furnished by Oroston; a Flamingo (*Phaenicopterus ruber*), a White-winged Scoter (*Oidemia deglandi*), a Red-breasted Merganser (*Merganser serrator*), a Peacock (*Pavo cristatus*), a Crowned Pigeon (*Gonsa victoria*), and an Impeyan Pheasant (*Lophophorus impeyanus*), obtained and mounted by Clark; and two skins of the Huia-bird (*Heteralocha acutirostris*), from New Zealand.

In the last Report, Mr. Agassiz mentioned (page 13) the fact that Mr. W. E. D. Scott hoped to secure funds sufficient to equip an additional Exhibition Room with isolated cases, each of which should illustrate, by a liberal number of artistically mounted birds, the individual, seasonal, or geographical variations of a single species. Unfortunately the financial depression of the past years has prevented Mr. Scott from obtaining a sum of money sufficiently large to warrant a serious beginning of this most desirable undertaking; but he has decided, nevertheless, to forward to the Museum, at an early date, about one hundred mounted birds (chiefly from Florida), which he wishes us to consider as forming the nucleus of the proposed collection. He has also promised to send with them some three thousand skins which he collected on Jamaica in the winter of 1890-91, and which represent very fully the characteristic birds of that island. As our West Indian collection is comparatively insignificant, this generous gift will be most timely and acceptable.

A number of skins of Mammals and Birds loaned for purposes of study or comparison to Dr. Slade and Mr. G. S. Miller, Jr., have been returned in good condition.

The Assistant in this Department has published the following notes and papers in "The Auk":—

Some Additional Eastern Records of Swainson's Hawk (*Buteo swainsoni*).

Capture of another *Ardetta neoxiana* at Toronto, Ontario. (Technical notes appended to a communication, under the above title, from Mr. Hubert H. Brown.)

Two Corrections.

REPORT ON THE REPTILES AND FISHES.

BY SAMUEL GARMAN.

DONATIONS to these Departments have been made by Messrs. Philipp Adams, Outram Bangs, A. N. Cheney, W. F. Clapp, Captain Josiah W. Cook, H. L. Clayton, Dr. G. H. Curry, Professor W. Faxon, Professor H. Garman, A. C. Gould, Dr. L. C. Jones, Gerrit S. Miller, F. H. Rindge (through the Peabody Museum), Dr. George B. Shattuck, and Robert G. Smith. In all cases the receipts were in excellent condition. Many of them were forwarded alive to be specially prepared for exhibition, to take the places of faded or otherwise inferior specimens. Work has been continued on the faunal representations, in which numerous changes have been made. In the storage collections also there has been a good deal of rearrangement, labelling, etc. Inspection discloses a comparatively small amount of damage by evaporation, breakage, or ravages of insects. A lot of live Reptiles was sent to the Zoölogical Society of London; others were furnished the students.

The Kentucky Fishes have been studied by Professor H. Garman in connection with a Zoloölogical Survey of that State. He has named the unidentified specimens, and supplied from his own collection certain species not before included in our lists. He reports his work much advanced by the opportunities here afforded.

More time than usual was this year devoted to study of the storage collections. This has resulted in a considerable amount of text and illustration in press on the way to publication, as well as in a large increase in the number of identified species and of new and rare species held by the Museum.

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

 BY SAMUEL HENSHAW.

GIFTS of specimens have been received from Messrs. Outram Bangs, William Beutenmüller, H. K. Burrison, W. R. Cabot, P. P. Calvert, S. C. Carpenter, T. D. A. Cockerell, J. H. Comstock, C. B. Cory, G. F. Curtiss, James Fletcher, G. B. Gordon, Roland Hayward, G. H. Horn, J. G. Jack, G. S. Miller, Jr., A. P. Morse, G. A. Purdie, E. A. Schwarz, S. H. Scudder, W. T. Sedgwick, Roland Thaxter, and H. F. Wickham.

For an excellent life-size crayon of Dr. Hagen, by Miss Meisel, the Department is indebted to Mrs. Hagen.

The use of the collections and of the library has increased very much during the year; among the persons who have studied in the Department at the Museum the following may be mentioned: Messrs. A. L. Babcock, William Beutenmüller, Frederick Blanchard, H. K. Burrison, J. H. Comstock, C. B. Davenport, J. H. Emerton, Roland Hayward, G. H. Horn, J. G. Jack, C. W. Johnson, A. P. Morse, A. S. Packard, E. B. Poulton, F. W. Russell, S. H. Scudder, Roland Thaxter, and W. L. Tower. Assistance has also been given Messrs. T. E. Bean, H. K. Burrison, P. P. Calvert, G. H. Cook, G. H. French, J. G. Jack, J. A. Lintner, A. P. Morse, F. W. Russell, W. T. Sedgwick, Roland Thaxter, C. H. T. Townsend, and the Biological Department of Wellesley College.

We are indebted to Dr. F. W. Goding for the determination of several Membracidæ, and to Mr. S. H. Scudder for the identification of our series of Ceuthophili; a few Orthoptera from the Galapagos Islands were also studied and named by Mr. Scudder (see Bulletin Museum Comparative Zoölogy, Vol. XXV. No. 1).

The collections are in good condition; three days of each week have been given by one of the Assistants to their inspection and care; the alcoholic Orthoptera have been assorted by families, and many specimens have been remounted and labelled.

The arrangement of the Papilionidæ and Sphingidæ among the Lepidoptera, and of the Termitidæ, Psocidæ, and Myrmeleonidæ among the Neuroptera has been revised ; in the Coleoptera a rearrangement of the Carabidæ has been commenced and considerable time has been spent in making portions of the collection more easily available for specialists. The Menge collection of spiders has been rearranged and labelled ; a part of the general collection of Arachnida has also been rearranged. The crowded condition of a large part of the Le Conte collection of Coleoptera makes a rearrangement desirable ; this has been accomplished for all of the Heteromera with the exception of the Tenebrionidæ.

The exhibition series for the North American Faunal Room, consisting of twelve boxes of Insecta, and representatives of Myriopoda and Arachnida has been completed ; the selection of the series for the African Faunal Room has been begun.

REPORT ON THE INVERTEBRATA (EXCLUSIVE OF INSECTS).

BY WALTER FAXON.

BUT few accessions to the collections have been received during the past year. The most noteworthy acquisitions consist of a fine representative collection of the marine Crustacea of Japan (purchased); two dozen specimens of *Nautilus pompilius* preserved in the flesh, from the South Pacific (purchased); three shells of *Nautilus micromphalus*, received from the Boston Society of Natural History; and a collection of Corals, Acalephs, and Crustacea, collected at the Bahama Islands in 1893 by the "Wild Duck" Expedition, and presented by Mr. A. Agassiz. A large collection of Molluscan shells brought together by the late Wm. W. Wheildon has been given to the Museum by his family. The Museum is also indebted for the gift of specimens to Messrs. R. T. Jackson, S. D. Judd, and C. B. Davenport.

The surface Schizopods of the "Albatross" Expedition of 1891, which were sent last year to Dr. Arnold Ortmann in Strassburg, have been returned, accompanied by a report which has been published in the Bulletin of the Museum (Vol. XXV. No. 8, September, 1894). Professor A. E. Verrill has returned a lot of the "Blake" Mollusca, and Professor Alphonse Milne Edwards the Galateidæ of the "Blake" Expeditions of 1877-79. The "Blake" Galateidæ form the subject of an elaborate report by MM. Milne Edwards and Bouvier, to be published, with twelve lithographic plates, in the Museum Memoirs. The memoir entitled "Considérations Générales sur la Famille des Galathéidés" by Milne Edwards and Bouvier, lately printed in Annales des Sciences Naturelles (Zoöl., sér., 1894, Vol. XVI. pp. 191-327), is based in part upon the "Hassler" and "Blake" collections of our Museum.

Material for study has been loaned to Dr. W. Giesbrecht of Naples, Dr. H. J. Hansen of Copenhagen, and Miss M. J. Rathbun of the U. S. National Museum in Washington. A set of deep-sea Crustacea from the "Albatross" Expedition of 1891 has been presented, with the permission of Colonel Marshall McDonald, U. S. Fish Commissioner, to Dr. Carl Chun of Breslau, and another to Oxford University.

Our collections have been visited by several specialists during the year just closed. Professor C. E. Nutting, in particular, spent considerable time in examining the Hydroids, in view of a monographic treatment of the Hydroids of the West Indian seas. Miss M. J. Rathbun spent two weeks in studying the Crustacea, her special purpose being a critical examination of A. Milne Edwards's types of West Indian Brachyura.

The work in the Exhibition Rooms of the Museum has been seriously delayed through failure to procure slate tablets of a suitable quality to replace the old and faded cardboards. In the mean time Miss Hannah Clark has employed a part of her time in restoring faded and discolored labels, thereby improving in a marked degree the appearance of some of the older exhibition collections. Dr. R. T. Jackson has been of great assistance to me in selecting certain fossil species for the systematic collections. The Department has especially profited by the good will of Dr. W. McM. Woodworth, who has selected and artfully prepared a collection of Worms for exhibition, more particularly for the Atlantic and Systematic Rooms.

A good deal of time was spent last winter in reviewing the alcoholic collections stored in the basement, which in some departments, from lack of systematic arrangement and a plain system of labelling, were in danger of becoming inaccessible.

The condition of the Conchological Collection has been a source of anxiety to me ever since it was placed in my charge. This is probably one of the largest collections of shells in the country, and has acquired an especial value from the number of types it contains, and from the fact that almost all of the specimens are identified. The determination of such a large number of shells represents a vast amount of labor bestowed upon the collection in the past by Mr. J. G. Anthony and Professor C. E. Hamlin. But the labors of both of these conchologists were closed by death before anything like a final systematic arrangement of the collection

was accomplished. Much of the original arrangement, moreover, was lost when the collection was removed from the old part of the building to the new. A large part of the collection consists of shells which have been glued to glass and slate tablets. With every movement of the drawers in which the tablets are placed the shells are liable to become loose, and the whole contents of the drawer to be thrown into confusion. A moiety of the collection apparently formed a second series consisting of unmounted shells in pasteboard trays, while scattered here and there are miscellaneous lots which have never been distributed. When specialists have come to consult this collection, the state of things described above has brought dismay to the visitor and chagrin to the curator. Miss Parker has now undertaken the arduous task of bringing this collection to order. The whole is to be arranged systematically in a single series, gaps being left for the insertion of future acquisitions in their proper places. In order that specimens and labels shall not part company, each tablet is placed in a paper tray. Every drawer is marked on the outside by a printed Class label and clearly written manuscript labels indicating the Family, Genus, and Subgenus contained therein. In order to have a convenient key to the collection, the arrangement is made to accord with the Paetel Catalogue, a copy of which will be permanently deposited in the Conchological Rooms. Miss Parker has already made good progress in this work.

REPORT ON THE PALÆONTOLOGICAL DEPARTMENT.

BY ALPHEUS HYATT.

CONSIDERABLE work has been accomplished in the investigation of the life history of many species of Nautiloids, and a number of preparations have been made of the early stages of important forms. Several new genera and species have been incidentally described in connection with this work, the types of which are in the collections.

The fossils necessary to fill blanks in the Systematic Collection of Cephalopods have been picked out and labelled, and are ready to be mounted.

The department is indebted to Dr. R. T. Jackson for superintending the work of mending the fossils of the Schary Collection, and for considerable work in reviewing and arranging collections.

Three students in palæontology engaged in special research under the direction of Dr. Jackson have had the privilege of studying in this department.

A fine specimen of *Triarthrus Becki* has been received from Dr. C. E. Beecher of Yale College which shows the antennæ and also a larval stage of the same species before the thoracic segments have appeared. This last supplements the series of original specimens in Walcott collection which begins with the stage having two thoracic segments. The Museum is also indebted to Dr. Beecher for a choice lot of silicified fossils from the Lower Helderberg and Hamilton series, some Crinoids from Crawfordsville and a specimen of *Enproops Danæ* from Mazon Creek. A fine series of invertebrate fossils from the Tertiaries of the Atlantic coast have been received from Prof. Wm. B. Clark of Johns Hopkins University.

The following papers have been published :—

Trias and Jura in the Western States. By Alpheus Hyatt, Bull. Geol. Soc. America, Vol. V. pp. 395-434.

Carboniferous Cephalopods. Second Paper, by same. 4th Ann. Rep. Geol. Surv. Texas, pp. 379-474 with 55 figures.

Phylogeny of an Acquired Characteristic. By same. Am. Nat., October, 1893, pp. 865-867, with one plate.

Phylogeny of an Acquired Characteristic. By same. Proc. Am. Phil. Soc., Philadelphia, Vol. XXII., No. 143, pp. 349-647, with 14 Plates.

REPORT ON THE LIBRARY.

BY MISS F. M. SLACK.

DURING the year ending September 1, 1894, the Library has received 578 volumes, 2,142 parts, and 84 pamphlets:—

	VOLUMES.	PARTS.	PAMPHLETS.
Gift	20	81	7
Exchange	166	792	56
Purchase	26	357	0
A. Agassiz	105	900	21
Binding Parts	261	0	0
Whitney Library	0	12	0
	<hr/> 578	<hr/> 2,142	<hr/> 84

The number of volumes now in the Library (exclusive of pamphlets and the Whitney Library) is 21,602. There are 15,337 pamphlets bound in 2,597 volumes, making the total number of volumes 24,199.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE ACADEMIC YEAR 1893-94.

Of the Bulletin:—

Vol. XXV.

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- No. 1. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "ALBATROSS." VII. The ORTHOPTERA of the Galapagos Islands. By S. H. SCUDDER. pp. 25. 3 Plates. September, 1893.
- No. 2. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "ALBATROSS." VIII. Compte-rendu sur les PANTOPODES. Par W. M. SCHIMKÉWITSCH. pp. 17. 2 Plates. December, 1893.
- No. 3. Contributions from the Zoölogical Laboratory. XXXVIII. A Method of ORIENTING SMALL OBJECTS for the Microtome. By W. McM. WOODWORTH. pp. 3. December, 1893.
- No. 4. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "ALBATROSS." IX. Report on the TURBELLARIA. By W. McM. WOODWORTH. pp. 4. 1 Plate. January, 1894.
- No. 5. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America, etc. X. Note préliminaire sur les ALCYONAIRES. Par TH. STUDER. pp. 17. January, 1894.
- No. 6. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America, etc. XI. The HYDROIDS. By S. F. CLARKE. pp. 7. 5 Plates. February, 1894.
- No. 7. Contributions from the Zoölogical Laboratory. XLI. The Origin of the ENDOCARDIUM in BONY FISHES. By A. T. HOLBROOK. pp. 19. 5 Plates. August, 1894.

[Vol. XXV. to be continued.]

[B]

THE Faculty of the Museum of Comparative Zoölogy will receive applications from candidates desiring to occupy the table at the Naples Zoölogical Station, which has been placed at its disposal from October 1, 1894.

The applicant must be (or have been recently) a student or instructor at some American University, preferably a person who has taken the degree of Ph. D. or S. D.; he must have published some creditable original investigation, and should be recommended as an able investigator by the Professor under whom he has studied.

Applicants will please forward to the undersigned their recommendations, and a statement of their qualifications, and of the subject to which they hope to devote themselves.

In order that the Faculty may make the most satisfactory disposition of the table during the whole year, the applicants are requested to state the length of time they desire to remain at Naples, and also the earliest and latest dates within which they can avail themselves of the appointment.

The Faculty will, at suitable intervals, nominate to the Corporation of Harvard College for approval the incumbent or incumbents for the year 1894-95.

ALEXANDER AGASSIZ,
Director.

[C]

INVESTED FUNDS OF THE MUSEUM.

IN THE HANDS OF THE TREASURER OF HARVARD COLLEGE, SEPT. 1, 1894.

Sturgis-Hooper Fund	\$100,000.00
Gray Fund	50,000.00
Agassiz Memorial Fund	297,933.10
Teachers and Pupils Fund	7,594.01
Permanent Fund	117,469.34
Humboldt Fund	7,740.66
Virginia Barret Gibbs Fund	5,000.00
	<hr/>
	\$585,737.11

The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Curator. The accounts are annually examined by a committee of the Museum Faculty. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts with vouchers to the payment of which the income is applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Virginia Barret Gibbs Scholarship Fund, of the value of \$250, is assigned annually, with the approval of the Faculty of the Museum, at the recommendation of the Professors of Zoölogy and of Comparative Anatomy in Harvard University, "in supporting or assisting to support one or more students who have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy."

The income of the Humboldt Fund (about \$400) can be applied for the benefit of one or more students of Natural History, either at the Museum, the Newport Marine Laboratory, the United States Fish Commission Station at Wood's Holl, or elsewhere.

Applications for the tables reserved for advanced Students at the Newport Marine Laboratory, and for the tables at the Wood's Holl Station, should be made to the Director of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

See Appendix B of this Report for the conditions upon which the table at the Naples Zoölogical Station is assigned.

The following Publications of the Museum of Comparative Zoölogy are in preparation:—

Reports on the Results of Dredging Operations in 1877, 1878, 1879, and 1890, in Charge of ALEX-
ANDER AGASSIZ, by the U. S. Coast Survey Steamer "Blake," as follows:—

- A. MILNE-EDWARDS. Crustacea of the "Blake."
- E. EHLERS. The Annelids of the "Blake."
- G. B. GOODE and T. BEAN. Deep-Sea Fishes of the East Coast of the United States.
"Blake" and "Albatross" Collections published in connection with the National Museum.
- A. A. HUBRECHT. The Nemerteans.
- C. HARTLAUB. The Comatulæ of the "Blake," with 15 Plates.
- A. E. VERRILL. The Alcyonaria of the "Blake."
- Illustrations of North American MARINE INVERTEBRATES, from Drawings by BURK-
HARDT, SONREL, and A. AGASSIZ, prepared under the Direction of L. AGASSIZ.

Selections from EMBRYOLOGICAL MONOGRAPHS, compiled by A. AGASSIZ, W. FAXON,
and E. L. MARK (discontinued for the present).

- A. AGASSIZ. The Acalephs of the East Coast of the United States.
- " On Dactylometra quinquécirra Agass.
- " A Reconnoissance of the Bahamas and Elevated Reefs of Cuba, in the Steam
Yacht "Wild Duck."
- " The Bermudas.

AGASSIZ and WHITMAN. Pelagic Fishes. Part II., with 14 Plates.

LOUIS CABOT. Immature State of the Odonata, Part IV.

E. L. MARK. Studies on Lepidosteus, continued.

" On Arachnactis.

W. B. SCOTT and H. F. OSBORN. White River Fossils, continued.

M. E. WADSWORTH. Lithological Studies. Part II.

ALFRED G. MAYER. On some Medusæ from the Bahamas.

J. D. WHITNEY. Origin and Mode of Occurrence of Iron and its Ores.

" Nomenclature and Classification of Ore Deposits.

R. T. HILL. Notes on the Geology of Cuba. With 9 Plates.

CHARLES WACHSMUTH and FRANK SPRINGER. The North American Fossil Crinoi-
dea Camerata. With 83 Plates.

Contributions from the ZOÖLOGICAL LABORATORY, in Charge of Professor E. L. MARK,
as follows:—

W. WHITNEY. The Histology of Thyone.

T. G. LEE. The Suprarenals in Amphibia.

Contributions from the GEOLOGICAL LABORATORY, in charge of Professor N. S. SHALER.

Contributions from the PETROGRAPHICAL LABORATORY, in charge of Professor J.
ELIOT WOLFF.

Studies from the NEWPORT MARINE LABORATORY, communicated by ALEXANDER
AGASSIZ.

A. AGASSIZ and W. McM. WOODWORTH. Some Variations in the Genus Eucope.

Reports on the Results of the Expedition of 1891 of the U. S. Fish Commission Steamer
"Albatross," Lieutenant Commander Z. L. TANNER, U. S. N., Commanding, in Charge of
ALEXANDER AGASSIZ, as follows:—

A. AGASSIZ. The Pelagic Fauna.

" The Echini.

" The Panamic Deep-Sea Fauna.

J. E. BENEDICT. The Annelids.

K. BRANDT. The Sagittæ.

" The Thalassicolæ.

G. CHUN. The Siphonophores.

" The Eyes of Deep-Sea Crustacea.

W. H. DALL. The Mollusks.

C. B. DAVENPORT. The Bryozoa.

W. FAXON. The Crustacea.

S. GARMAN. The Fishes.

W. GIESBRECHT. The Copepods.

A. GOËS. The Foraminifera.

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rescent Organs of Fishes.

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H. B. WARD. The Sipunculids.

H. V. WILSON. The Sponges.

W. McM. WOODWORTH. The Planarians.

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Reports on the Results of the Expedition of 1891 of the U. S. Fish Commission Steamer "Albatross," Lieut. Commander Z. L. Tanner, U. S. N., Commanding, in charge of Alexander Agassiz.

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